NATIONAL MARINE FISHERIES SERVICE
ENDANGERED SPECIES ACT
BIOLOGICAL OPINION

Agency: Federal Energy Regulatory Commission

Activity Considered: New License for the Lockwood Hydroelectric Project (FERC Project No. 2574-032)

Conducted by: National Marine Fisheries Service
Northeast Region

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Approved by: Chris Mantzaris for Patricia Kurkul

This constitutes the National Marine Fisheries Service's (NOAA Fisheries) biological opinion (BO) on the effects of the issuance by the Federal Energy Regulatory Commission (FERC) of a new License for the Lockwood Hydroelectric Project located on the Kennebec River in the city of Waterville and the town of Winslow, Maine on threatened and endangered species in accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.). This BO is based on information provided in the October 2003 Draft Environmental Assessment (EA), the April 2004 Final EA, additional information provided by FERC, numerous correspondence commencing on August 29, 2002 and other sources of information. A complete administrative record of this consultation will be kept at the NOAA Fisheries Northeast Regional Office. Formal consultation was initiated on April 23, 2004.

CONSULTATION HISTORY

On July 29, 2002, FERC issued a notice to several agencies, including NOAA Fisheries, indicating that FERC was reviewing an application for a new 20-year license for the continued operation of the Lockwood Hydroelectric Project and that FERC intended to prepare an EA for the project. NOAA Fisheries responded to the accompanying request for information in a letter dated August 29, 2002 indicating that a population of the federally endangered shortnose sturgeon (*Acipenser brevirostrum*) was known to exist in the Kennebec River and that since the removal of the Edwards Dam in 1999, several shortnose sturgeon had been observed between Augusta and the location of the Lockwood Project. In May 2003, NOAA Fisheries was informed that on May 19, 2003 a shortnose sturgeon was stranded in the bypass reach during annual flashboard replacement. The fish was rescued from the pool and released into the river channel without any apparent injury. This was the first documented occurrence of a shortnose sturgeon at the Lockwood Project. In a letter dated October 16, 2003, FERC requested formal consultation under the ESA for the relicensing of the Lockwood Project. In this letter, FERC concluded that the relicensing was likely to adversely affect shortnose sturgeon. Included with this letter was a copy of the draft EA issued on October 23, 2003 as well as an indication of where in the EA information on shortnose sturgeon was located. In a letter dated November 17, 2003, NOAA Fisheries responded to this letter and indicated that additional information was required before consultation could be initiated. FERC responded to this in a letter dated April

23, 2004 in which FERC provided the additional information requested as well as a copy of the final EA issued on April 22, 2004. As NOAA Fisheries had all the information necessary for consultation at that time, the date of the April 23, 2004 letter serves as the initiation of formal consultation.

DESCRIPTION OF THE PROPOSED ACTION

On April 29, 2002, FPL Energy Maine Hydro, LLC (FPLE Maine) filed on behalf of Merimil Limited Partnership an application for a new license, under Part I of the Federal Power Act, to continue operating its existing 6.915-megawatt (MW) Lockwood Hydroelectric Project (FERC No. 2574), located on the Kennebec River in Kennebec County, Maine. The Project is located on the Kennebec River at river mile (RM) 63 in the city of Waterville and town of Winslow, Kennebec County, Maine (Figure 1). The present dam was developed in 1868 and was improved to a concrete dam in 1913. The original powerhouse was built in 1919, with the first two turbines installed in 1920 and four more added in the following few years. These six units were refurbished and a new Kaplan unit and powerhouse were added from 1985 to 1989. The average annual energy production is 42,687 megawatt-hours (MWh). The Project's dam sits atop what was historically known as Ticonic Falls, a ledge outcrop that extends across the entire river, consisting of a compact series of steep ledge terraces descending irregularly from each embankment to a deep backwatered pool. During normal operation, there are several small, shallow pools scattered along some portions of the terraces. Below the terraced outcrop, the river consists of a gradually widening, low gradient back-watered pool with predominantly ledge substrate (see Figures 1 and 2).

The existing Project consists of:

- an 875-foot long concrete gravity dam with two spillway sections equipped with flashboards
- a 160-foot long forebay headgate structure
- a 450-foot long forebay canal
- an approximately 1300-foot long bypassed reach
- hydraulic capacity of 5600 cubic feet per second (cfs)
- six turbine generator units with a total nameplate capacity of 4.800 megawatts (MW) located in the original powerhouse, and one turbine generator unit with a nameplate capacity of 2.115 MW located in the second powerhouse
- a project impoundment with a length of approximately 1.2 miles and a surface area of 81.5 acres
- a 4160-volt transmission line that runs about 225 feet from the original powerhouse to the local utility intertie, and a 1000-foot long, 12400-volt transmission line that extends from the second powerhouse to a local utility tie-in, and
- various appurtenant facilities.

Merimil proposes to continue operating the project in a run-of-river (ROR) mode, and to make no changes in operation. The headpond will be maintained no more than 6 inches below the top of the spillways flashboards when the flashboards are in place, and no more than 1 foot below the spillways crest when flashboards are being replaced. In addition to ROR operations, Merimil is proposing the following protection and enhancement measures:

- Continue leakage flows of 30 to 50 cfs into the Ticonic Falls area downstream of the dam (the bypassed reach)
- Conduct an annual independent engineering inspection/flow gauging to ensure a minimum leakage flow of 30 to 50 cfs
- Supplement the flow gaging by installing three staff gages in pools in the bypassed reach
- Notify the fisheries agencies (including NOAA Fisheries) prior to drawdown of the reservoir to 1 foot below the dam crest for flashboard replacement
- Continue fish rescue efforts in the spillway during flashboard replacement, with identification, enumeration, and return of all fish to pools at the base of Ticonic Falls
- Continue the operation of the log/debris sluice as an interim downstream fish passage measure
- Install interim and permanent upstream and downstream fish passage facilities in accordance with the 1998 Lower Kennebec River Comprehensive Hydropower Settlement Accord (1998 Accord; see below)
- Protect existing wetlands and state-listed rare, threatened, or endangered plant species, through the continuation of ROR operations and maintenance of the leakage flows below the dam; and
- Maintain the existing shoreline angler access site in the project's lower tailwater area.

The 1998 Accord establishes a schedule for the installation of permanent and/or interim fish passage facilities at the Lockwood Project. The 1998 Accord calls for installation of the following:

- Upstream and downstream eel passage in 2002 (not yet completed)
- Interim trap, lift and transfer facilities for upstream passage of anadromous species at the powerhouse by May 1, 2006
- Permanent upstream and downstream passage to be operational within 2 years following the earlier of either of two biological triggers, but not before May 1, 2010: 8,000 American shad in any single season is captured at the interim trap, lift and sorting facility at Lockwood, or a biological assessment conducted by the resource agencies demonstrates that the growth of salmon and river herring (alewife and blueback herring) runs makes it necessary to adopt an alternative approach for triggering fishway installation.

In addition, FERC proposes to add the following measures to the new License:

- Provide a minimum flow of 2114 cfs, or inflow if less, below the project tailrace

- Develop a reservoir level monitoring plan utilizing the headpond level transducer currently installed in the impoundment
- Develop and implement a plan to provide, when the flashboards are in place, a continuous minimum flow of 50 cfs, or inflow if less, into the bypassed reach
- Develop a gaging plan for minimum bypassed reach flows and the 2114 cfs minimum flow in the project tailrace and upon FERC approval implement the plan
- Develop and implement a bald eagle management plan
- Develop and implement a rescue plan for shortnose sturgeon stranded in the bypassed reach during flashboard repair/replacement
- Develop an operation plan for the interim fish lift including handling protocols for shortnose sturgeon captured in the lift to be filed for FERC approval by February 1, 2006
- Develop and implement an effectiveness study to evaluate the effectiveness of the interim fish passage measures to be filed for FERC approval by February 1, 2006.

NOAA Fisheries anticipates that FERC will issue a new License for the Lockwood Project which incorporates all of the above recommendations. While the EA describes several other alternatives for the Project, these have been removed from consideration by FERC. As such, this BO will focus on the effects of a relicensing action including the measures indicated above (i.e., the Preferred Alternative identified in the final EA).

Action Area
The action area is defined in 50 CFR 402.02 as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." The Action Area for this consultation encompasses the area from the Lockwood dam to the downstream confluence with the Sebasticook River (approximately 0.5 miles downstream of the project). In the final EA, FERC indicated that the effects of project operations do not extend below the mouth of the Sebasticook River. This area is expected to encompass all of the direct and indirect effects of the Lockwood Project.

The Kennebec River Basin covers an area of 5910 square miles in central Maine. The Lockwood Project is the lowermost dam on the mainstem Kennebec River. The drainage area of the project is 4228 square miles. The project area can be generally characterized as urban, with the east shoreline of the reservoir dominated by an industrial complex.

STATUS OF AFFECTED SPECIES

This section will focus on the status of the species within the action area, summarizing information necessary to establish the environmental baseline and to assess the effects of the proposed action.

The only endangered or threatened species under NOAA Fisheries' jurisdiction in the Action Area is the endangered shortnose sturgeon (*Acipenser brevirostrum*). No critical habitat has been designated for shortnose sturgeon.

Shortnose sturgeon life history

Shortnose sturgeon are benthic fish that mainly occupy the deep channel sections of large rivers. They feed on a variety of benthic and epibenthic invertebrates including molluscs, crustaceans (amphipods, chironomids, isopods), and oligochaete worms (Vladykov and Greeley 1963; Dadswell 1979 *in* NOAA Fisheries 1998). Shortnose sturgeon have similar lengths at maturity (45-55 cm fork length) throughout their range, but, because sturgeon in southern rivers grow faster than those in northern rivers, southern sturgeon mature at younger ages (Dadswell et al. 1984). Shortnose sturgeon are long-lived (30-40 years) and, particularly in the northern extent of their range, mature at late ages. In the north, males reach maturity at 5 to 10 years, while females mature between 7 and 13 years. Based on limited data, females spawn every three to five years while males spawn approximately every two years. The spawning period is estimated to last from a few days to several weeks. Spawning begins from late winter/early spring (southern rivers) to mid to late spring (northern rivers) when the freshwater temperatures increase to 8-9°C. Several published reports have presented the problems facing long-lived species that delay sexual maturity (Crouse et al. 1987; Crowder et al. 1994; Crouse 1999). In general, these reports concluded that animals that delay sexual maturity and reproduction must have high annual survival as juveniles through adults to ensure that enough juveniles survive to reproductive maturity and then reproduce enough times to maintain stable population sizes.

Total instantaneous mortality rates (Z) are available for the Saint John River (0.12 - 0.15; ages 14-55; Dadswell 1979), Upper Connecticut River (0.12; Taubert 1980b), and Pee Dee-Winyah River (0.08-0.12; Dadswell et al. 1984). Total instantaneous natural mortality (M) for shortnose sturgeon in the lower Connecticut River was estimated to be 0.13 (T. Savoy, Connecticut Department of Environmental Protection, personal communication). There is no recruitment information available for shortnose sturgeon because there are no commercial fisheries for the species. Estimates of annual egg production for this species are difficult to calculate because females do not spawn every year (Dadswell et al. 1984). Further, females may abort spawning attempts, possibly due to interrupted migrations or unsuitable environmental conditions (NOAA Fisheries 1998). Thus, annual egg production is likely to vary greatly in this species. Fecundity estimates have been made and range from 27,000 to 208,000 eggs/female (Dadswell et al. 1984).

At hatching, shortnose sturgeon are blackish-colored, 7-11mm long and resemble tadpoles (Buckley and Kynard 1981). In 9-12 days, the yolk sac is absorbed and the sturgeon develops into larvae which are about 15mm total length (TL; Buckley and Kynard 1981). Sturgeon larvae are believed to begin downstream migrations at about 20mm TL. Laboratory studies suggest that young sturgeon move downstream in a 2-step migration; a 2 to 3-day migration by larvae followed by a residency period by young of the year (YOY), then a resumption of migration by yearlings in the second summer of life (Kynard 1997). Juvenile shortnose sturgeon (3-10 years old) reside in the interface between saltwater and freshwater in most rivers (NOAA Fisheries 1998).

In populations that have free access to the total length of a river (e.g., no dams within the species' range in a river: Saint John, Kennebec, Altamaha, Savannah, Delaware and Merrimack Rivers), spawning areas are located at the farthest upstream reach of the river (NOAA Fisheries 1998). In the northern extent of their range, shortnose sturgeon exhibit three distinct movement patterns. These migratory movements are associated with spawning, feeding, and overwintering activities. In spring, as water temperatures rise above 8°C, pre-spawning shortnose sturgeon move from overwintering grounds to spawning areas. Spawning occurs from mid/late March to mid/late May depending upon location and water temperature. Sturgeon spawn in upper, freshwater areas and feed and overwinter in both fresh and saline habitats. Shortnose sturgeon spawning migrations are characterized by rapid, directed and often extensive upstream movement (NOAA Fisheries 1998).

Shortnose sturgeon are believed to spawn at discrete sites within the river (Kieffer and Kynard 1996). In the Merrimack River, males returned to only one reach during a four year telemetry study (Kieffer and Kynard 1996). Squires (1982) found that during the three years of the study in the Androscoggin River, adults returned to a 1-km reach below the Brunswick Dam and Kieffer and Kynard (1996) found that adults spawned within a 2-km reach in the Connecticut River for three consecutive years. Spawning occurs over channel habitats containing gravel, rubble, or rock-cobble substrates (Dadswell et al. 1984; NOAA Fisheries 1998). Additional environmental conditions associated with spawning activity include decreasing river discharge following the peak spring freshet, water temperatures ranging from 8 - 12° C, and bottom water velocities of 0.4 to 0.7 m/sec (Dadswell et al. 1984; NOAA Fisheries 1998). For northern shortnose sturgeon, the temperature range for spawning is 6.5-18.0C (Kieffer and Kynard in press). The eggs are separate when spawned but become adhesive within approximately 20 minutes of fertilization (Dadswell et al. 1984). Between 8° and 12°C, eggs generally hatch after approximately 13 days. The larvae are photonegative, remaining on the bottom for several days. Buckley and Kynard (1981) found week old larvae to be photonegative and form aggregations with other larvae in concealment.

Adult shortnose sturgeon typically leave the spawning grounds soon after spawning. Non-spawning movements include rapid, directed post-spawning movements to downstream feeding areas in spring and localized, wandering movements in summer and winter (Dadswell et al. 1984; Buckley and Kynard 1985; O'Herron et al. 1993). Kieffer and Kynard (1993) reported that post-spawning migrations were correlated with increasing spring water temperature and river discharge. Young-of-the-year shortnose sturgeon are believed to move downstream after hatching (Dovel 1981) but remain within freshwater habitats. Older juveniles tend to move downstream in fall and winter as water temperatures decline and the salt wedge recedes. Juveniles move upstream in spring and feed mostly in freshwater reaches during summer.

Juvenile shortnose sturgeon generally move upstream in spring and summer and move back downstream in fall and winter; however, these movements usually occur in the region above the saltwater/freshwater interface (Dadswell et al. 1984; Hall et al. 1991). Non-spawning movements include wandering movements in summer and winter (Dadswell et al. 1984; Buckley and Kynard 1985; O'Herron et al. 1993). Kieffer and Kynard (1993) reported that post-spawning migrations were correlated with increasing spring water temperature and river discharge. Adult sturgeon occurring in freshwater or freshwater/tidal reaches of rivers in summer and winter often occupy only a few short reaches of the total length (Buckley and Kynard 1985). Summer concentration areas in southern rivers are cool, deep, thermal refugia, where adult and juvenile shortnose sturgeon congregate (Flourney et al. 1992; Rogers and Weber 1994; Rogers and Weber 1995; Weber 1996). While shortnose sturgeon are occasionally collected near the mouths of rivers and often spend time in estuaries, they are not known to participate in coastal migrations and are rarely documented in their non-natal river.

The temperature preference for shortnose sturgeon is not known (Dadswell et al. 1984) but shortnose sturgeon have been found in waters with temperatures as low as 2 to 3°C (Dadswell et al. 1984) and as high as 34°C (Heidt and Gilbert 1978). However, temperatures above 28°C are thought to adversely affect shortnose sturgeon. In the Altamaha River, temperatures of 28-30°C during summer months create unsuitable conditions and shortnose sturgeon are found in deep cool water refuges.

Shortnose sturgeon are known to occur at a wide range of depths. A minimum depth of 0.6m is necessary for the unimpeded swimming by adults. Shortnose sturgeon are known to occur at depths of up to 30m but are generally found in waters less than 20m (Dadswell et al. 1984; Dadswell 1979). Shortnose sturgeon have also demonstrated tolerance to a wide range of salinities. Shortnose sturgeon have been documented in freshwater (Taubert 1980; Taubert and Dadswell 1980) and in waters with salinity of 30 parts-per-thousand (ppt) (Holland and Yeverton 1973; Saunders and Smith 1978). Mcleave et al. (1977) reported adults moving freely through a wide range of salinities, crossing waters with differences of up to 10ppt within a two hour period. The tolerance of shortnose sturgeon to increasing salinity is thought to increase with age (Kynard 1996). Shortnose sturgeon typically occur in the deepest parts of rivers or estuaries where suitable oxygen and salinity values are present (Gilbert 1989).

Status and Trends of Shortnose Sturgeon Rangewide
Shortnose sturgeon were listed as endangered on March 11, 1967 (32 FR 4001), and the species remained on the endangered species list with the enactment of the ESA in 1973. Although the original listing notice did not cite reasons for listing the species, a 1973 Resource Publication, issued by the US Department of the Interior, stated that shortnose sturgeon were "in peril...gone in most of the rivers of its former range [but] probably not as yet extinct" (USDOI 1973). Pollution and overfishing, including bycatch in the shad fishery, were listed as principal reasons for the species' decline. In the late nineteenth and early twentieth centuries, shortnose sturgeon commonly were taken in a commercial fishery for the closely related and commercially valuable Atlantic sturgeon (*Acipenser oxyrinchus*). More than a century of extensive fishing for sturgeon contributed to the decline of shortnose sturgeon along the east coast. Heavy industrial development during the twentieth century in rivers inhabited by sturgeon impaired water quality and impeded these species' recovery; possibly resulting in substantially reduced abundance of shortnose sturgeon populations within portions of the species' ranges (e.g., southernmost rivers of the species range: Santilla, St. Marys and St. Johns Rivers). A shortnose sturgeon recovery plan was published in December 1998 to promote the conservation and recovery of the species (see NOAA Fisheries 1998). Shortnose sturgeon are listed as "vulnerable" on the IUCN Red List.

Although shortnose sturgeon are listed as endangered range-wide, in the final recovery plan NOAA Fisheries recognized 19 separate populations occurring throughout the range of the species. These populations are in New Brunswick Canada (1); Maine (2); Massachusetts (1); Connecticut (1); New York (1); New Jersey/Delaware (1); Maryland and Virginia (1); North Carolina (1); South Carolina (4); Georgia (4); and Florida (2). NOAA Fisheries has not formally recognized distinct population segments (DPS)[1] of shortnose sturgeon under the ESA. Although genetic information within and among shortnose sturgeon occurring in different river systems is largely unknown, life history studies indicate that shortnose sturgeon populations from different river systems are substantially reproductively isolated (Kynard 1997) and, therefore, should be considered discrete. The 1998 Recovery Plan indicates that while genetic information may reveal that interbreeding does not occur between rivers that drain into a common estuary, at this time, such river systems are considered a single population compromised of breeding subpopulations (NOAA Fisheries 1998).

More recent studies have provided evidence that suggests that years of isolation between populations of shortnose sturgeon have led to morphological and genetic variation. Walsh et al. (2001) examined morphological and genetic variation of shortnose sturgeon in three rivers (Kennebec, Androscoggin, and Hudson). The study found that the Hudson River shortnose sturgeon population differed markedly from the other two rivers for most morphological features (total length, fork length, head and snout length, mouth width, interorbital width and dorsal scute count, left lateral scute count, right ventral scute count). Significant differences were found between fish from Androscoggin and Kennebec rivers for interorbital width and lateral scute counts which suggests that even though the Androscoggin and Kennebec rivers drain into a common estuary, these rivers support largely discrete populations of shortnose sturgeon. The study also found significant genetic differences among all three populations indicating substantial reproductive isolation among them and that the observed morphological differences may be partly or wholly genetic.

Grunwald et al. (2002) examined mitochondrial DNA (mtDNA) from shortnose sturgeon in eleven river populations. The analysis demonstrated that all shortnose sturgeon populations examined showed moderate to high levels of genetic diversity as measured by haplotypic diversity indices. The limited sharing of haplotypes and the high number of private haplotypes are indicative of high homing fidelity and low gene flow. The researchers determined that glaciation in the Pleistocene Era was likely the most significant factor in shaping the phylogeographic pattern of mtDNA diversity and population structure of shortnose sturgeon. The Northern glaciated region extended south to the Hudson River while the southern non-glaciated region begins with the Delaware River. There is a high prevalence of haplotypes restricted to either of these two regions and relatively few are shared; this represents a historical subdivision that is tied to an important geological phenomenon that reflects historical isolation. Analyses of haplotype frequencies at the level of individual rivers showed significant differences among all systems in which reproduction is known to occur. This implies that although higher level genetic stock relationships exist (i.e., southern vs. northern and other regional subdivisions), shortnose sturgeon appear to be discrete stocks, and low gene flow exists between the majority of populations.

Waldman et al. (2002) also conducted mtDNA analysis on shortnose sturgeon from 11 river

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1 The definition of species under the ESA includes any subspecies of fish, wildlife, or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature. To be considered a DPS, a population segment must meet two criteria under NOAA Fisheries policy. First, it must be discrete, or separated, from other populations of its species or subspecies. Second, it must be significant, or essential, to the long-term conservation status of its species or subspecies. This formal legal procedure to designate DPSs for shortnose sturgeon has not been undertaken.

systems and identified 29 haplotypes. Of these haplotypes, 11 were unique to northern, glaciated systems and 13 were unique to the southern non-glaciated systems. Only 5 were shared between them. This analysis suggests that shortnose sturgeon show high structuring and discreteness and that low gene flow rates indicated strong homing fidelity.

Wirgin et al. (in press), also conducted mtDNA analysis on shortnose sturgeon from 12 rivers (St. John, Kennebec, Androscoggin, Upper Connecticut, Lower Connecticut, Hudson, Delaware, Chesapeake Bay, Cooper, Peedee, Savannah, Ogeechee and Altamaha). This analysis suggested that most population segments are independent and that genetic variation among groups was high.

The best available information demonstrates differences in life history and habitat preferences between northern and southern river systems and given the species' anadromous breeding habits, the rare occurrence of migration between river systems, and the documented genetic differences between river populations, it is unlikely that populations in adjacent river systems interbreed with any regularity. This likely accounts for the failure of shortnose sturgeon to repopulate river systems from which they have been extirpated, despite the geographic closeness of persisting populations. This characteristic of shortnose sturgeon also complicates recovery and persistence of this species in the future because, if a river population is extirpated in the future, it is unlikely that this river will be recolonized. Consequently, this BO will treat the nineteen separate populations of shortnose sturgeon as subpopulations (one of which occurs in the action area) for the purposes of this analysis.

Historically, shortnose sturgeon are believed to have inhabited nearly all major rivers and estuaries along nearly the entire east coast of North America. The range extended from the St John River in New Brunswick, Canada to the Indian River in Florida. Today, only 19 populations remain ranging from the St. Johns River, Florida (possibly extirpated from this system) to the Saint John River in New Brunswick, Canada. Shortnose sturgeon are large, long lived fish species. The present range of shortnose sturgeon is disjunct, with northern populations separated from southern populations by a distance of about 400 km. The species is anadromous in the southern portion of its range (i.e., south of Chesapeake Bay), while northern populations are amphidromous (NOAA Fisheries 1998). Population sizes vary across the species' range. From available estimates, the smallest populations occur in the Cape Fear (~8 adults; Moser and Ross 1995) and Merrimack Rivers (~100 adults; M. Kieffer, United States Geological Survey, personal communication), while the largest populations are found in the Saint John (~100,000; Dadswell 1979) and Hudson Rivers (~61,000; Bain et al. 1998). As indicated in Kynard 1996, adult abundance is less than the minimum estimated viable population abundance of 1000 adults for 5 of 11 surveyed northern populations and all natural southern populations. Kynard 1996 indicates that all aspects of the species' life history indicate that shortnose sturgeon should be abundant in most rivers. As such, the expected abundance of adults in northern and north-central populations should be thousands to tens of thousands of adults. Expected abundance in southern rivers is uncertain, but large rivers should likely have thousands of adults. The only river systems likely supporting populations of these sizes are the St John, Hudson and possibly the Delaware and the Kennebec, making the continued success of shortnose sturgeon in these rivers critical to the species as a whole. While no reliable estimate of the size of either the total species or the shortnose sturgeon population in the Northeastern United States exists, it is clearly below the size that could be supported if the threats to shortnose sturgeon were removed.

Threats to shortnose sturgeon recovery

The Shortnose Sturgeon Recovery Plan (NOAA Fisheries 1998) identifies habitat degradation or loss (resulting, for example, from dams, bridge construction, channel dredging, and pollutant discharges) and mortality (resulting, for example, from impingement on cooling water intake screens, dredging and incidental capture in other fisheries) as principal threats to the species' survival.

Several natural and anthropogenic factors continue to threaten the recovery of shortnose sturgeon. Shortnose sturgeon continue to be taken incidentally in fisheries along the east coast and are probably targeted by poachers throughout their range (Dadswell 1979; Dovel et al. 1992; Collins et al. 1996). Bridge construction and demolition projects may interfere with normal shortnose sturgeon migratory movements and disturb sturgeon concentration areas. Unless appropriate precautions are made, internal damage and/or death may result from blasting projects with powerful explosives. Hydroelectric dams may affect shortnose sturgeon by restricting habitat, altering river flows or temperatures necessary for successful spawning and/or migration and causing mortalities to fish that become entrained in turbines. Maintenance dredging of Federal navigation channels and other areas can adversely affect or jeopardize shortnose sturgeon populations. Hydraulic dredges can lethally take sturgeon by entraining sturgeon in dredge dragarms and impeller pumps. Mechanical dredges have also been documented to lethally take shortnose sturgeon. In addition to direct effects, dredging operations may also impact shortnose sturgeon by destroying benthic feeding areas, disrupting spawning migrations, and filling spawning habitat with resuspended fine sediments. Shortnose sturgeon are susceptible to impingement on cooling water intake screens at power plants. Electric power and nuclear power generating plants can affect sturgeon by impinging larger fish on cooling water intake screens and entraining larval fish. The operation of power plants can have unforeseen and extremely detrimental impacts to water quality which can affect shortnose sturgeon. For example, the St. Stephen Power Plant near Lake Moultrie, South Carolina was shut down for several days in June 1991 when large mats of aquatic plants entered the plant's intake canal and clogged the cooling water intake gates. Decomposing plant material in the tailrace canal coupled with the turbine shut down (allowing no flow of water) triggered a low dissolved oxygen water condition downstream and a subsequent fish kill. The South Carolina Wildlife and Marine Resources Department reported that twenty shortnose sturgeon were killed during this low dissolved oxygen event.

Contaminants, including toxic metals, polychlorinated aromatic hydrocarbons (PAHs), pesticides, and polychlorinated biphenyls (PCBs) can have substantial deleterious effects on aquatic life including production of acute lesions, growth retardation, and reproductive impairment (Cooper 1989; Sinderman 1994). Ultimately, toxins introduced to the water column become associated with the benthos and can be particularly harmful to benthic organisms (Varanasi 1992) like sturgeon. Heavy metals and organochlorine compounds are known to accumulate in fat tissues of sturgeon, but their long term effects are not yet known (Ruelle and Henry 1992; Ruelle and Kennlyne 1993). Available data suggests that early life stages of fish are more susceptible to environmental and pollutant stress than older life stages (Rosenthal and Alderdice 1976).

Although there is scant information available on the levels of contaminants in shortnose sturgeon tissues, some research on other related species indicates that concern about the effects of contaminants on the health of sturgeon populations is warranted. Detectible levels of chlordane, DDE (1,1-dichloro-2, 2-bis(p-chlorophenyl)ethylene), DDT (dichlorodiphenyl-trichloroethane), and dieldrin, and elevated levels of PCBs, cadmium, mercury, and selenium were found in pallid sturgeon tissue from the Missouri River (Ruelle and Henry 1994). These compounds were found in high enough levels to suggest they may be causing reproductive failure and/or increased physiological stress (Ruelle and Henry 1994). In addition to compiling data on contaminant levels, Ruelle and Henry also determined that heavy metals and organochlorine compounds (i.e. PCBs) accumulate in fat tissues. Although the long term effects of the accumulation of contaminants in fat tissues is not yet known, some speculate that lipophilic toxins could be transferred to eggs and potentially inhibit egg viability. In other fish species, reproductive impairment, reduced egg viability, and reduced survival of larval fish are associated with elevated levels of environmental contaminants including chlorinated hydrocarbons. A strong correlation that has been made between fish weight, fish fork length, and DDE concentration in pallid sturgeon livers indicates that DDE increases proportionally with fish size (NOAA Fisheries 1998).

Contaminant analysis was conducted on two shortnose sturgeon from the Delaware River in the fall of 2002. Muscle, liver, and gonad tissue were analyzed for contaminants (ERC 2002). Sixteen metals, two semivolatile compounds, three organochlorine pesticides, one PCB Aroclor, as well as polychlorinated dibenzo-p-dioxins (PCDDs), and polychlorinated dibenzofurans (PCDFs) were detected in one or more of the tissue samples. Levels of aluminum, cadmium, PCDDs, PCDFs, PCBs, DDE (an organochlorine pesticide) were detected in the "adverse affect" range. It is of particular concern that of the above chemicals, PCDDs, DDE, PCBs and cadmium, were detected as these have been identified as endocrine disrupting chemicals. While no directed studies of chemical contamination in shortnose sturgeon in the Delaware River have been undertaken, it is evident that the heavy industrialization of the Delaware River is likely adversely affecting this population. As much of the Connecticut River is also industrialized, it is likely that shortnose sturgeon in the Connecticut River experience similar contaminant loads.

During summer months, especially in southern areas, shortnose sturgeon must cope with the physiological stress of water temperatures that may exceed 28°C. Flourney et al.(1992) suspected that, during these periods, shortnose sturgeon congregate in river regions which support conditions that relieve physiological stress (i.e., in cool deep thermal refuges). In southern rivers where sturgeon movements have been tracked, sturgeon refrain from moving during warm water conditions and are often captured at release locations during these periods (Flourney et al. 1992; Rogers and Weber 1994; Weber 1996). The loss and/or manipulation of these discrete refuge habitats may limit or be limiting population survival, especially in southern river systems.

Pulp mill, silvicultural, agricultural, and sewer discharges, as well as a combination of non-point source discharges, which contain elevated temperatures or high biological demand, can reduce dissolved oxygen levels. According to the Recovery Plan for shortnose sturgeon (NOAA Fisheries 1998) low oxygen levels (below 5 mg/L) are known to be stressful to aquatic life, and presumably, sturgeon would be adversely affected by levels below this limit. Shortnose sturgeon may be less tolerant of low dissolved oxygen levels in high ambient water temperatures and show signs of stress in water temperatures higher than 28°C (Flourney et al. 1992). At these temperatures, concomitant low levels of dissolved oxygen may be lethal.

Status of Shortnose Sturgeon in the Kennebec River

The NOAA Fisheries recovery plan indicates that shortnose sturgeon occur in the estuarine complex formed by the Sheepscot, Kennebec, and Androscoggin rivers. Sturgeon were tagged with Carlin tags from 1977 to 1980, with recoveries in each of the following years. A Schnabel estimate of 7,222 adults for the combined estuarine complex was computed from the tagging and recapture data from 1977 through 1981 (Squiers et al. 1982). The Maine Department of Marine Resources (DMR) conducted studies of shortnose sturgeon in the Kennebec River from 1996 through 2000. A Schnabel estimate using tagging and recapture data from 1998, 1999 and 2000 reveals a population estimate of 9488 for the estuarine complex.

Tracking studies to delineate spawning habitat were performed on the Androscoggin River during 1993. Gill nets were used to capture study animals and catch rates were recorded. Gill net catch-per-unit-effort during this study was the highest recorded in this area, suggesting that the population in the Androscoggin has increased since last surveyed. In 1999, the Edward's Dam, which represented the first significant impediment to the northward migration of shortnose sturgeon in the Kennebec River, was removed. With the removal of the dam, approximately 17 miles of previously inaccessible sturgeon habitat north of Augusta was made available. In May 2003, a shortnose sturgeon was observed at the base of the Lockwood Dam, confirming that shortnose sturgeon are now present in this area of the River. It is currently unknown whether spawning may now take place upstream of the former Edward's Dam location. The Lockwood dam is located at the site of a natural falls (Ticonic Falls). It is not thought that shortnose sturgeon would have been able to pass upstream of these falls and Ticonic Falls is thought to be the natural upstream limit for shortnose sturgeon in the Kennebec River. The Schnabel estimate from 1998-2000 is the most recent population estimate for the Kennebec River shortnose sturgeon population; however, this estimate includes fish from the Androscoggin and Sheepscot rivers as well and does not include an estimate of the size of the juvenile population. A comparison of the population estimate for the estuarine complex from 1982 (Squiers et al. 1982) to 2000 (Maine DMR 2003) suggests that the adult population has grown by approximately 30% in the last twenty years. Based on this information, NOAA Fisheries believes that the shortnose sturgeon population in the Kennebec River is increasing; however, without more information on the status of more recent year classes (i.e., juveniles) it is difficult to speculate about the long term survival and recovery of this population.

On September 19, 1994, NOAA Fisheries received a petition from the Edwards Manufacturing Company, Inc., to delist shortnose sturgeon occurring in the Androscoggin and Kennebec rivers. In the ensuing status review, NOAA Fisheries found that the petition to delist this population segment was not warranted because: 1) the population estimate used by the petitioners was less reliable than the best estimate accepted by NOAA Fisheries; 2) the best population estimate available did not exceed the interim threshold at which the population segment would be a candidate for delisting; 3) no recent information was available to assess the population dynamics; and 4) threats to shortnose sturgeon habitat still exist throughout the Androscoggin and

Kennebec rivers (NOAA Fisheries 1996).

In the Kennebec River, movement to the spawning grounds occurs in early spring (April - May). Spawning sites have been identified near Gardiner in the Kennebec River, at the base of the Brunswick Dam in the Androscoggin River, and may also occur in the Cathance River. In 1993, Maine DMR confirmed the exact location of the spawning sites in the Androscoggin River and determined that both adult and larval sturgeon use the region below the Brunswick Dam. Movement to the spawning areas is triggered in part by water temperature and fish typically arrive at the spawning locations when water temperatures are between 8-9°C. Shortnose sturgeon quickly leave the spawning grounds for summer foraging areas when temperatures exceed 15°C (Squiers et al. 1982).

Summer foraging areas have been identified in the Sasanoa River entrance and in the mainstem of the Kennebec River below Bath. Between June and September, shortnose sturgeon forage in shallow waters of mud flats that are covered with rooted aquatic plants. The vegetation provides many plant surfaces for the preferred food items of sturgeon including benthic crustaceans, molluscs, and insects. In the summer months, concentrations of shortnose sturgeon have also been known to move up into the freshwater reaches of the Kennebec River and foraging shortnose sturgeon have also been seen in Montsweag Bay in the Sheepscot River, which is located near the eastern end of the Sasanoa River (NOAA Fisheries 1996).

Squiers (1982) reported that during 1979, concentrations of shortnose sturgeon were in the lower estuary below Bath during summer; in 1980 and 1981 large concentrations were found in the mid-estuary in the Bath region, most likely utilizing the abundant food resources in the Sasanoa River entrance. Subsequent tracking and trawl data from 1996-1999 indicate that shortnose sturgeon may be found in this area from at least late March through the beginning of December (Normandeau 1999). Studies indicate that at least a portion of the shortnose sturgeon population in the Kennebec River overwinters in Merrymeeting Bay (Maine DMR 1996). The seasonal migrations of shortnose sturgeon are believed to be correlated with changes in water temperature. In 1999, when a tracking study was performed by Normandeau Associates, the water temperature near Bath Iron Works (BIW) reached the 8-9°C threshold (believed to be the trigger prompting spawning fish to migrate to the spawning area) in mid-April. Also during the tracking study, several fish presumed to be non-spawning sturgeon, were documented in the Chops Point and Swan Island areas (north of Doubling Point) in late March and then were found to have migrated south to the BIW region (e.g., north and south of the BIW Pier and Museum Point) early in April.

Until a study aimed at specifically determining overwintering locations was conducted by the Maine Department of Marine Resources (DMR) in 1996 for the Maine Department of Transportation (DOT), the sites thought to be the most likely overwintering sites were deep pools below Bluff Head, and possibly in adjacent estuaries such as the Sheepscot (Squiers and Robillard 1997). The 1996 study of overwintering activity suggests that at least one overwintering site is located above Bath. This is based on tracking 15 shortnose sturgeon collected and released in the vicinity of the Sasanoa River (Pleasant Cove), Winnegance Cove (near the Doubling Point reach), and Merrymeeting Bay (north of Bath and the Sasanoa River entrance). Tracking was done from October through January. Eleven of these fish were relocated in Merrymeeting Bay. Two of the fish from Pleasant Cove were never found in Merrymeeting Bay; one Pleasant Cove fish moved to Winnegance Cove and back to Pleasant Cove and another moved to Days Ferry (half way between Bath and Merrymeeting Bay). All of the fish that continued to transmit after November were only found in upper Merrymeeting Bay on the east-side of Swan Island. This is consistent with the trends for movement of shortnose sturgeon in the Delaware River (O'Herron 1992). Overwintering sturgeon in the Delaware River are found in the area of Newbold Island, in the Trenton to Kinkora river reach, in an area geographically similar to the area around Swan Island.

Fisheries sampling was conducted from April 1997 through June 1998 by Normandeau Associates, using a semi-balloon otter trawl with 1 ½ inch mesh in the cod end and a ¼ inch liner. Sampling occurred monthly in April, May and December. At the request of NOAA Fisheries and Maine DMR, sampling frequency increased to twice monthly from June through November 1997 and April through June 1998. Trawl locations were located near the BIW outfitting pier (T1), south of the pier near the dry dock facility (T2), and south of Trufant Ledge (T3). In August, 1997 additional stations were added near Sasanoa Point (T4), Hanson Bay (T5), north of Hospital Point on the west (T6) and east (T7) shores, and in Winnegance Creek (T8). During high slack tide, two tows were made at each sampling location. Three of these sampling locations are in the vicinity of Doubling Point (T6, T7 and T8) (located approximately one nautical mile south of BIW). Trawl data indicate that no shortnose sturgeon were collected from Stations T6 or T7 between August 1997 and March 1998. One shortnose sturgeon was collected at Station T6 on April 1, 1998 and shortnose sturgeon were collected from Station T7 on April 1 and April 23, 1998. No shortnose sturgeon were collected in May or June 1998 at these stations. Several shortnose sturgeon were collected in August through October 1997 from Station T8 and one was captured on November 17, 1997. None were collected at this station from December 1997 through mid-May 1998. Three shortnose sturgeon were collected in late May 1998 and none were collected in June 1998.

Beginning in 1998, 17 shortnose sturgeon were collected via gillnet in the BIW area and were tagged and released near the capture site. Tracking began in 1998 and continued into 1999. Some of the fixed receivers were moved from their original locations and redeployed in areas of higher shortnose sturgeon abundance. In 1999, tracking was performed in three primary locations from late March through early May and mid-October through Mid-December. Through December 15, all scans detected shortnose sturgeon in the vicinity of BIW. From October 21 through November 4, 1999, seven shortnose sturgeon were detected ranging from North to South of the BIW Pier, Chops Point, Fishers Eddy, and Doubling Point. Five of these sturgeon were in the immediate vicinity of BIW. From November 4 through November 12, 1999, four tagged shortnose sturgeon were detected, three of which were in the immediate vicinity of BIW. Tagged shortnose sturgeon were also tracked in the vicinity of BIW from November 18 – 23, one of which was in the immediate vicinity of BIW. The tracks from November 23 – December 15 detected two shortnose sturgeon in the immediate vicinity of BIW. No tracking was attempted after December 15 due to icing conditions in the Kennebec River.

No studies on shortnose sturgeon use of the Kennebec River have been initiated since the removal of the Edwards Dam making it difficult to assess the use of this upper River area by shortnose sturgeon. However, since the removal of the Edwards Dam, NOAA Fisheries has received many reports of occurrences of shortnose sturgeon located upstream of the location of the former Edwards Dam. The stranding of a shortnose sturgeon at the Lockwood Project in May 2003 confirms that shortnose sturgeon are migrating as far upstream as the Lockwood Project. It is also unknown if additional spawning sites above the site of the former Edwards Dam are now being used. In populations of shortnose sturgeon that have free access to the total length of a river (e.g., no dam within the species' historical range in the river), spawning areas are located at the most upstream reach of the river used by sturgeon (NOAA Fisheries 1998). Based on this pattern, it is likely that shortnose sturgeon would be present in the uppermost accessible reaches of the River (i.e., the base of the Dam) in the spring (April – June).

ENVIRONMENTAL BASELINE

Environmental baselines for biological opinions include the past and present impacts of all state, federal or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early Section 7 consultation, and the impact of state or private actions that are contemporaneous with the consultation in process (50 CFR 402.02). The environmental baseline for this biological opinion includes the effects of several activities that may affect the survival and recovery of the endangered species in the action area. The activities that shape the environmental baseline in the action area of this consultation generally include: dredging operations, water quality, scientific research, and fisheries, and recovery activities associated with reducing those impacts.

Effects of Federal Actions that have Undergone Formal or Early Section 7 Consultation

The construction and maintenance of Federal navigation channels and other maintenance dredging projects have been identified as a source of sturgeon mortality. The authorized Federal navigation project in the Kennebec River consists of a channel 27 feet deep at mean low water (MLW) and 500 feet wide extending about 13 miles upstream from the river mouth at Popham Beach to the city of Bath. About eight miles upstream of Bath, the Federal navigation project provides for a navigation channel 17 feet deep MLW and 150 feet wide along the east side of Swan Island for 14 miles to the city of Gardiner. An 18-foot deep MLW and 150 feet wide channel extends through the ledge at Lovejoy Narrows opposite the upper end of Swan Island. A training wall was built along the Beef Rock Shoal opposite the lower end of Swan Island and another training wall was built opposite South Gardiner. A secondary channel 12 feet deep and 100 feet wide was provided along the west-side of Swan Island to Richmond, with the navigation channel deepening to 15 feet MLW near the upper end of Swan Island. A 16-foot deep MLW channel was provided at Gardiner. A channel 11 feet deep MLW and 150 feet wide extends seven miles to the upper limit of the Federal navigation project in Augusta.

The Army Corps of Engineers (ACOE) has been performing maintenance dredging at the Doubling Point and Popham Beach reaches in the Kennebec River Federal navigation channel since 1950 at approximately three-year intervals. These sites have been dredged a total of approximately 15 times since 1950. The most recent dredging occurred under an emergency permit in October 2003. Dredging has been performed using a hopper dredge and the amount of material removed has ranged from 4,707 cy to 108,830 cy. Disposal sites have historically been located in the river north of Bluff head in 95-100 feet of water and approximately 0.4 nautical miles south of Jackknife Ledge in depths of 40-50 feet. These disposal sites were last used in the 2003 dredging operations. Seasonal dredging restrictions, allowing operations to occur at the Doubling Point reach from September 15 to October 15 and from March 1 through April 30 and at the site at Popham Beach from November 1 through April 30, were implemented after informal consultations between ACOE and NOAA Fisheries were conducted in 1989 and again in 1991. These seasonal restrictions were changed due to new information on the distribution of shortnose sturgeon and formalized in a biological opinion issued by NOAA Fisheries to the ACOE in 1997. The dredging window that was established in 1997 allowed dredging in both areas from November 1 through April 30. This window was subsequently amended in 2000 to December 1 to March 1 to reflect new information on the seasonal distribution of shortnose sturgeon in the vicinity of Doubling Point.

Despite the seasonal restrictions that have been imposed, dredging in the vicinity of Doubling Point may cause shortnose sturgeon displacement, injury and/or mortality, as well as affect foraging and migration behavior. In a BO dated April 16, 2002, the effects of maintenance dredging of the Federal navigation channel at Doubling Point and Popham Beach on shortnose sturgeon were assessed for the November 1 – April 30 time frame. Accompanying this BO was an Incidental Take Statement which authorized the annual incidental taking of 2 shortnose sturgeon at Doubling Point during December 1 – March 1 and a total of 4 shortnose sturgeon in the November 1 – November 30 or March 2 – April 30 time frame. Maintenance dredging of these reaches was performed in April 2002. No incidental takes were observed during that dredge cycle. Due to emergency conditions, the Doubling Point and Popham Beach reaches were dredged most recently in October 2003. During this dredge operation, five shortnose sturgeon were taken by a hopper dredge in the Doubling Point reach. Dredging occurred over the course of four days. Two of the takes were lethal with two of the additional takes accounting for shortnose sturgeon with significant injuries. The fifth fish was released with minor injuries.

Dredging also regularly occurs at the BIW sinking basin. Dredging most recently occurred in April 2003. In March 2002, the ACOE contacted NOAA Fisheries regarding the proposed permit for maintenance dredging of the sinking basin. At this time, NOAA Fisheries told the ACOE that shortnose sturgeon are known to be in the vicinity of the BIW facility year-round but that concentrations of shortnose sturgeon would be largest from the late spring to early fall. At this time there was no evidence that shortnose sturgeon would be adversely affected by mechanical dredging, the method used at the BIW sinking basin. Consultation was concluded informally as ACOE implemented a condition in the permit that restricted dredging to occur only from November 1 – April 30 of any year. At that time, NOAA Fisheries concurred with the ACOE's determination that shortnose sturgeon were not likely to be adversely affected by the dredging activities in the sinking basin.

On April 30, 2003, the ACOE contacted NOAA Fisheries to report that a shortnose sturgeon was killed by the mechanical dredge used to dredge the sinking basin. This take was the first evidence of lethal interactions between shortnose sturgeon and mechanical dredges. This take caused consultation on the dredging operations at the BIW sinking basin to be reinitiated. A BO dated December 1, 2003 assessed the impacts of dredging the sinking basin for the December 1, 2003 – February 28, 2004 time frame. Incidental take of 9 shortnose sturgeon (based on

79,300cy of material being dredged) was authorized by the accompanying incidental take statement. No shortnose sturgeon were documented to be killed by the dredging activities that occurred from December 2003 – February 2004.

Effects of Non-Federally Regulated Actions

Non-Federally Regulated Fishery Operations

Unauthorized take of shortnose sturgeon is prohibited by the ESA. However, shortnose sturgeon are taken incidentally in other anadromous fisheries along the East Coast and may be targeted by poachers (NOAA Fisheries 1998). The Kennebec River is an important corridor for migratory movements of various species including alewife (*Alosa pseudohernegus*), American eel (*Anguilla rostrata*), Atlantic sturgeon (*Acipenser oxyrhynchus*), blueback herring (*Alosa aestivalis*), American shad (*Alosa sapidissima*), rainbow smelt (*Osmerus mordax*), striped bass (*Morone saxatilis*) and lobster (*Homarus americanus*). Historically, the river and its tributaries supported the largest commercial fishery for shad in the State of Maine. However, pollution and the construction of dams decimated the shad runs in the late 1920's and early 1930's. Shortnose sturgeon in the Kennebec River may have been taken as bycatch in the shad fishery or other fisheries active in the action area. It has been estimated that approximately 20 shortnose sturgeon are killed each year in the commercial shad fishery and an additional number are also likely taken in recreational fisheries (T. Savoy pers. comm. in NOAA Fisheries 1998). However, the incidental take of shortnose sturgeon in the river has not been well documented due to confusion over distinguishing between Atlantic sturgeon and shortnose sturgeon. Due to a lack of reporting, no information on the number of shortnose sturgeon caught and released or killed in commercial or recreational fisheries on the Kennebec River is available.

Other Potential Sources of Impacts in the Action Area

Scientific Studies

There have been limited studies targeting the shortnose sturgeon population present in the Kennebec River and estuarine complex – tracking studies in 1993 for spawning habitat; studies performed by Squiers et al. in 1979, 1980, and 1981; tracking by Squiers et al. to delineate overwintering locations in 1996; a trawl survey by Normandeau Associates from 1997-1998; and a tracking survey by Normandeau Associates from 1998-1999. As a result of techniques associated with these sampling studies, shortnose sturgeon have been subjected to capturing, handling, and tagging. It is possible that research in the action area may have influenced and/or altered the migration patterns, reproductive success, foraging behavior, and survival of shortnose sturgeon.

Contaminants and Water Quality

Contaminants including heavy metals, polychlorinated aromatic hydrocarbons (PAHs), pesticides, and polychlorinated biphenyls (PCBs), can have serious, deleterious effects on aquatic life and are associated with the production of acute lesions, growth retardation, and reproductive impairment (Ruelle and Keenlyne 1993). Contaminants introduced into the water column or through the food chain, eventually become associated with the benthos where bottom dwelling species like shortnose sturgeon are particularly vulnerable.

Several characteristics of shortnose sturgeon life history including long life span, extended residence in estuarine habitats, and being a benthic omnivore, predispose this species to long term, repeated exposure to environmental contaminants and bioaccumulation of toxicants (Dadswell 1979). Contaminant analysis of tissues from a shortnose sturgeon from the Kennebec River revealed the presence of fourteen metals, one semivolatile compound, one PCB Aroclor, Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) in one or more of the tissue samples. Of these chemicals, cadmium and zinc were detected at concentrations above an adverse effect concentration reported for fish in the literature (ERC 2003). Thomas and Khan (1997) demonstrated that exposure to cadmium at concentrations well below the concentration detected in the shortnose sturgeon significantly increased ovarian production of estradiol and testosterone which can adversely affect reproductive function. The concentration of zinc detected in the shortnose sturgeon liver tissue was slightly less than the effect concentration for reduced egg hatchability reported by Holcombe et al. (1979) and exceeded the effect concentration for reduced survival cited in Flos et al. (1979).

Ruelle and Henry (1994) determined that heavy metals and organochlorine compounds (i.e., PCBs) accumulate in fat tissues. Although the long term effects of the accumulation of contaminants in fat tissues is not yet known, some speculate that lipophilic toxins could be transferred to eggs and potentially inhibit egg viability. PCBs may also contribute to a decreased immunity to fin rot. In other fish species, reproductive impairment, reduced egg viability, and reduced survival of larval fish are associated with elevated levels of environmental contaminants including chlorinated hydrocarbons. A strong correlation that has been made between fish weight, fish fork length, and DDE concentration in pallid sturgeon livers indicates that DDE increase proportionally with fish size (NOAA Fisheries 1998).

Point source discharges (i.e., municipal wastewater, paper mill effluent, industrial or power plant cooling water or waste water) and compounds associated with discharges (i.e., metals, dioxins, dissolved solids, phenols, and hydrocarbons) contribute to poor water quality and may also impact the health of sturgeon populations. The compounds associated with discharges can alter the pH or receiving waters, which may lead to mortality, changes in fish behavior, deformations, and reduced egg production and survival.

Hydroelectric facilities
The Kennebec River Basin has been extensively developed for hydroelectric power production. There are 9 facilities upstream of the Lockwood Project on the mainstem Kennebec River and an additional 4 on upstream tributaries. There are also 7 facilities located on downstream tributaries. While the effects of these other facilities are largely unknown, they all have the potential to affect flow in the River and may affect shortnose sturgeon habitat and/or migration patterns.

Summary and Synthesis of the Status of the Species and Environmental Baseline
Impacts from actions occurring in the Environmental Baseline for the Kennebec River have the potential to impact shortnose sturgeon. Despite improvements in water quality, the elimination of fishing for this species, and the removal of impediments to upstream passage, shortnose sturgeon still face numerous threats in this river system, primarily industrial pollution and dredging operations associated with Federal navigation projects and private industry.

Pollution continues to be a major problem for this river system, which continues to receive discharges from sewer treatment facilities and paper production facilities (metals, dioxin, dissolved solids, phenols, and hydrocarbons). Compounds associated with discharges, including metals, dioxin, furans, dissolved solids, phenols, and hydrocarbons, may lead to mortalities, alternations in fish behavior, deformations, and reduced egg production and survival (Alabaster 1980 in NOAA Fisheries 1996). Shortnose sturgeon have been killed in dredging operations in the Kennebec River and these activities are likely to continue in the future. Indirect effects to sturgeon from dredging operations include the removal of food resources and the resuspension of contaminants found in the river sediments. The Lockwood project has negatively impacted shortnose sturgeon in the past, as evidenced by the stranding of one shortnose sturgeon in 2003. However, with the removal of the Edwards Dam in 1999, there are no longer any impediments to migration for shortnose sturgeon in this river as even if the Lockwood Dam were removed it is unlikely that shortnose sturgeon would migrate past Ticonic Falls. The effect of other hydroelectric facilities in the Kennebec River Basin is largely unknown; however, it is likely that they affect flow in the River which may affect the habitat and/or migration patterns of shortnose sturgeon.

The Schnabel estimate from 1998-2000 is the most recent population estimate for the Kennebec River shortnose sturgeon population; however, this estimate includes fish from the Androscoggin and Sheepscot rivers as well and does not include an estimate of the size of the juvenile population. A comparison of the population estimate for the estuarine complex from 1982 (Squiers et al. 1982) to 2000 (Maine DMR 2003) suggests that the adult population has grown by approximately 30% in the last twenty years. Based on this information, NOAA Fisheries believes that the shortnose sturgeon population in the Kennebec River is increasing; however, without more information on the status of more recent year classes (i.e., juveniles) and a better understanding of how the spawning population is distributed between the Kennebec and Androscoggin Rivers it is difficult to speculate about the long term survival and recovery of this population.

EFFECTS OF THE ACTION

This section of a biological opinion assesses the direct and indirect effects of the proposed action on threatened or endangered species or critical habitat, together with the effects of other activities that are interrelated or interdependent (50 CFR 402.02). Indirect effects are those that are caused later in time, but are still reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend upon the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. This biological opinion examines the likely effects (direct and indirect) of the proposed action on the Kennebec River shortnose sturgeon population and its habitat within the context of the species' current status and the environmental baseline.

The biology of shortnose sturgeon complicates the assessment of shortnose sturgeon movement and impacts to the species, as these fish have a long life span, delayed sexual maturity and non-annual spawning behavior (Buckley and Kynard 1985). For instance, migration patterns that are observed during one year are not always seen in consecutive years because mature adults will not return to the spawning site each year.

Shortnose sturgeon habitat use varies by season. During the summer, shortnose sturgeon adults and older juveniles are found on summer foraging grounds feeding in shallow waters with sandy or muddy bottoms containing abundant macrophytes. While the bypassed reach and tailwaters of the Project contain suitable depths for sturgeon, it is unlikely that they occupy these waters during the summer due to a lack of suitable substrate for foraging (ERC 2001). Additionally, summer foraging areas in the Kennebec River have been documented in the Sasanoa River entrance and the Kennebec River mainstem below Bath, approximately 40 miles downstream of the Lockwood project. However, if foraging sturgeon were to occur below the project and in the bypassed reach during the summer when river flows are low, ROR operations along with the release of 50cfs into the bypassed reach is expected to result in a depth of water that is adequate for any sturgeon that may utilize project waters. During the fall, shortnose sturgeon migrate to deep (generally >30 feet) overwintering grounds. These depths do not occur near the Lockwood Project and in the Kennebec River overwintering sites for shortnose sturgeon have been documented in the lower estuary of Merrymeeting Bay.

Based upon shortnose sturgeon data from other river systems, including the Androscoggin River which also flows into Merrymeeting Bay, shortnose sturgeon are most likely to move upstream into project waters during spawning migrations in April and May (see below). Shortnose sturgeon are known to stay on spawning grounds from several days to several weeks. Even if no spawning is taking place in the immediate vicinity of the Lockwood Project, shortnose sturgeon may still occur in the area during this time of year. This assumption has been confirmed by the presence of a shortnose sturgeon at the Project in May 2003. As such, NOAA Fisheries concludes that sturgeon may be present in the waters of the Lockwood Project from April through June of any year.

As the Lockwood Project is located at the presumed historic upstream limit for shortnose sturgeon in the Kennebec River, this dam does not represent a barrier to shortnose sturgeon passage. However, the operation and maintenance of the dam still has the potential to affect shortnose sturgeon. At this time, the only known likely direct effects to shortnose sturgeon are stranding in the pools at the base of the Dam during repairs to or replacement of the flashboards and the likelihood for shortnose sturgeon to be caught in fish lifts intended to displace migrating fish upstream of the Dam. In addition to these direct effects, the operation of the Lockwood Project may affect suitable spawning habitat in the vicinity of the dam, flow fluctuations and water quality in the River.

Indirect Effects

Effect on Suitable Spawning Habitat

A recent study in the Connecticut River (Kieffer and Kynard, in press) indicated that during spawning, the daily mean temperatures ranged from 6.5-14.7°C. Temperatures required for spawning are likely to be met in the Kennebec River from late April through June. The Kieffer and Kynard study also documented that females spawned in water depths of 3-16 feet with a peak at 5-6 feet. Bottom water velocity at spawning site was a mean of 2.3 feet/second with the greatest usage of 2.5-4.1 feet/second. The only substrate type females used was cobble/rubble (4 – 12 inches diameter). However, in the Androscoggin River, shortnose sturgeon have been documented to spawn below the Brunswick Hydroelectric Project at depths of approximately 8 to 12 feet on a substrate of ledge, boulder and cobble interspersed with sand and gravel at a water velocity of approximately 5 feet/second (FERC 1997).

A study conducted by ERC in 2001 in preparation for the relicensing of the Lockwood project, determined that although suitable depths, temperatures and substrates exist within the Lockwood Project waters, suitable spawning area is likely limited by low water velocities, particularly in the bypassed reach. Although any spawning would occur during high spring flows, mean water column velocities within the deeper portions of the bypassed reach are relatively low (<0.5 feet/second) at both leakage and spillage flows, due to the inherent bedrock-ledge hydraulic controls that create the deep backwatered pool that occupies much of the bypassed reach. The only suitable water velocities within the project area are in the tailwaters below the project, but based upon all habitat characteristics, this reach is thought to contain only marginal spawning habitat (ERC 2001).

During the spring spawning period, river flows are usually well in excess of project hydraulic capacity, with spillage occurring 98.7 and 85.8 percent of the time during April and May, respectively. Since these flows are beyond the control of the dam, even if significant spawning were to occur immediately below the dam, the operation of the project would not be likely to have any affect on river flows at the time that any spawning is occurring.

As indicated above and in FERC's EA, the best available information suggests that the waters adjacent to the Lockwood Project contains only marginally suitable habitat for shortnose sturgeon spawning (ERC 2001). In addition, NOAA Fisheries has no evidence that shortnose sturgeon are attempting to spawn in this location. As such, it is unlikely that spawning will occur in any year at this location. Additionally, as river flows are typically beyond the capacity of the facility during shortnose sturgeon spawning season, the operation of the dam is unlikely to affect shortnose sturgeon spawning at any other downstream location.

Other Effects of Dam Operations

Migratory patterns and strandings below the dam can be influenced by flow conditions. The License requires that the Lockwood Project continue to be operated in a run-of-river mode where the project inflow will approximately equal the outflow into the tailrace. This should have a positive influence on flow and water fluctuation patterns in the Kennebec River. The 13 hydropower projects located upstream of the Lockwood Dam on the Kennebec River and its major tributaries effect the flows to the Lockwood Project, so the flow conditions at the Lockwood Dam that could result in impeded migration will likely be influenced by conditions at the upstream hydropower facilities. Run-of-river operations at the proposed project will reduce, to the extent possible within this licensing action, flow fluctuations and elevated turbidity that could impact shortnose sturgeon downstream of the Project.

Dam operations may also impact water quality in rivers. Monitoring by Merimil and the Maine Department of Environmental Protection indicates that the project is not negatively impacting the water quality of the Kennebec River and that standards for dissolved oxygen (at least 5mg/L), E. coli bacteria and other standards for aquatic life are being met. Low dissolved oxygen levels (below 5ppm) are known to negatively affect shortnose sturgeon. Dissolved oxygen readings in the lower impoundment area and in the upper tail water area of the bypassed reach ranged from 7.4 to 10 mg/L and average about 8.8 mg/L. This level of dissolved oxygen is suitable for shortnose sturgeon. Water temperatures are highest in July and August. Monitoring in July and

August of 2000 and 2001 indicated that temperatures ranged from 22 – 25°C. The preferred temperature for shortnose sturgeon is thought to be below 28°C. The water temperatures at the project should be sufficiently protective of any sturgeon that may be present in the summer months.. The continued operation of the Lockwood project under a new License is not expected to adversely affect the water quality of the Kennebec River in a way that would affect the shortnose sturgeon in the River.

Direct Effects

Stranding of Shortnose Sturgeon in Pools Below the Dam

As evidenced by the capture of a shortnose sturgeon in a pool at the base of the dam on May 19, 2003, there is the potential for shortnose sturgeon to become stranded in the pools in the bypassed reach. While no other shortnose sturgeon have been documented in these pools, it is likely that as shortnose sturgeon have free access from downstream overwintering areas to the Lockwood project area, shortnose sturgeon will continue to be present in the action area in the spring.

Stranding of fish below the dam has not been documented at times outside of when flashboards are being replaced. Stranding occurs when there are inadequate zones-of-passage between the scour pools due to no or very low flow into the pools. Flashboard damage or failure at Lockwood typically occurs in winter and spring during periods of high flow, and they are not replaced until flows subside enough to safely reinstall them, generally during late spring or early summer[2]. Depending on the circumstances of failure, impoundment levels could drop as much as 1.25 feet. To allow safe access to replace the failed flashboards, Merimil typically draws down the reservoir 1 foot below the spillway.

Flashboard replacement has the potential to stop all flows into the bypassed reach for the approximately 8-hour period it takes to replace them and refill the pond. According to FERC, flashboard replacement or other operational restrictions that create no-spill and no-leakage conditions in the bypassed reach typically occur one or two times a year[3]. During no-leakage periods, the connective flows between the ledge pools are largely eliminated, isolating any fish that might be inhabiting the pools. Without inflow, water quality can quickly deteriorate in these pools, particularly during warmer weather.

Outside of flashboard replacement, and during periods of no spillage, the bypassed reach currently receives leakage flows between approximately 50cfs at full headpond level and 30 cfs at a drawdown of 6 inches below the top of the flashboards. Based upon studies conducted by Merimil, FERC has concluded that leakage flows of approximately 50cfs maintain adequate zones-of-passage for fish between the scour pools and the deep backwatered pool in the lower bypassed reach. The new license will require that when the flashboards are in place, a continuous flow of 50cfs be required in the bypassed reach. Adequate flow and water depths are expected to occur at all times with the exception of when flashboards are being replaced. This

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2 Records over the past 10 years indicated that flashboard replacement occurred during May in 2 years, June in 4 years, July in 2 years, and did not occur at all in 2 years.

3 When there is no spill over the top of the dam (river flows less than 4500 cfs), flow in the bypass reach is limited to leakage around or though the flashboards. The amount of leakage is currently estimated at 30 – 50 cfs. The new license will require leakage flows of 50cfs.

data supports the assumption that stranding will only occur during flashboard replacement activities or during other operational restrictions that create no-spill or no-leakage conditions.

Data from the Holyoke Hydroelectric project on the Connecticut River (FERC No. 2004) can help in assessing the likely effects of stranding on shortnose sturgeon. In general, at this facility, several shortnose sturgeon are removed from pools at the base of the dam each year when spill over the dam ceases. Shortnose sturgeon that have been rescued from these pools have been observed to have significant hemorrhaging along the ventral scutes and damage to their fins. If not rescued, these fish would likely have died from these wounds, stress from increased temperature and decreased dissolved oxygen, or a combination of these factors. Since implementing rescue procedures in 1996, there has been no detected mortality of shortnose sturgeon stranded in pools.

Without the development of a rescue procedure for the Lockwood Project, shortnose sturgeon stranded in the pools at the base of the Dam would likely suffer injuries and possibly be killed. However, the implementation of a rescue procedure and handling plan (see Appendix A) as recommended by FERC will serve to reduce the likelihood of injury and will eliminate this potential source of mortality. While the capture of shortnose sturgeon in nets and the subsequent transport and handling may stress the fish, this stress is not likely to be long lasting and should have no effect on the survival of the fish. Based on the occurrence of one shortnose sturgeon stranding in the bypass reach in 2003, NOAA Fisheries anticipates that one shortnose sturgeon is likely to be stranded in these pools each time there are no-spill or no-leakage conditions in the bypassed reach during April through June when shortnose sturgeon are expected to be present at the Project. As such, it is likely that one or two shortnose sturgeon will be caught in these pools per year (based on one fish per incident which FERC indicates will occur once or twice per year). The implementation of a rescue plan and the use of proper handling techniques will minimize the potential for injury. No mortality is expected to occur due to the short time period fish will be caught in the pools and the implementation of proper handling techniques.

Capture of Shortnose Sturgeon in Upstream Passage Facilities
By May 1, 2006, Merimil must have an operational interim fish lift. It is expected that some time between 2010 and 2014, this will be replaced with a permanent fish lift. It is expected that the fish lift will be operational during the time of year when shortnose sturgeon are likely to be present (April - June). Shortnose sturgeon are not likely to be seeking to actively migrate above the dam and it is unlikely that shortnose sturgeon will be caught in the fish lift. As this facility is not yet operational, it is difficult to assess the impacts of the fish lift on shortnose sturgeon. However, data exists on the effects of the fish lift at the Holyoke Hydroelectric Project on the Connecticut River on shortnose sturgeon. This data suggests that most fish lifts do a poor job of attracting shortnose sturgeon to them and that fish lifts that are easily accessible by other species (i.e, shad, salmon etc.) are not easily accessed by shortnose sturgeon. Attraction and lifting efficiencies for shortnose sturgeon at the Holyoke Project have been estimated at approximately 11%.

This information suggests that as the fish lift facilities at Lockwood will not be designed to target shortnose sturgeon, the interim and permanent lifts are likely to be extremely inefficient at attracting and lifting shortnose sturgeon over the Dam. In addition, it should be noted that the shortnose sturgeon at the Holyoke Dam are actively seeking to migrate upstream to spawning and overwintering grounds while the sturgeon at the Lockwood Dam are not expected to be experiencing this drive to migrate further upstream. The fish lifts at the Lockwood Project will be designed to accommodate surface migrating fish. As shortnose sturgeon are benthic fish, this is likely to further reduce the likelihood of shortnose sturgeon entering the fish lifts. Therefore, shortnose sturgeon are not expected to be attracted to the fish lifts, and shortnose sturgeon are not likely to occur in the fish lifts.

Because it is possible, although remotely so, that a shortnose sturgeon may enter the fish lift, the license to be issued by FERC includes a condition that requires Merimil to require that all fish lift operators are trained in handling shortnose sturgeon and that any shortnose sturgeon caught in the fish lift be removed with long handled nets and returned to the tailrace. This condition would ensure that no shortnose sturgeon are inadvertently passed above the dam, or injured in the process of returning them below the dam.

CUMULATIVE EFFECTS

Cumulative effects are defined in 50 CFR §402.02 as those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation.

Several features of the shortnose sturgeon's natural history, including delayed maturation, non-annual spawning (Dadswell et al. 1984; Boreman 1997), and long life-span, affect the rate at which recovery can proceed. The future state and private activities in the Kennebec River that are reasonably certain to occur throughout the term of the new license are recreational and commercial fisheries, pollutants, upstream hydropower development, development and/or construction activities resulting in excessive water turbidity and habitat degradation and continued dredging of the Federal navigation channel.

Impacts to shortnose sturgeon from non-federal activities are largely unknown in this river. It is possible that occasional recreational and commercial fishing for anadromous fish species may result in incidental takes of shortnose sturgeon. However, positive identification and distinction between Atlantic sturgeon and shortnose sturgeon are difficult and therefore, historically, takes have not been quantified. Pollution from point and non-point sources has been a major problem in this river system, which continues to receive discharges from sewer treatment facilities and paper production facilities (metals, dioxin, dissolved solids, phenols, and hydrocarbons). Contaminants introduced into the water column or through the food chain, eventually become associated with the benthos where bottom dwelling species like shortnose sturgeon are particularly vulnerable. Upstream hydropower development has the potential to effect water quality and flow in the action area. As noted above, dredging has the potential to take shortnose sturgeon and to negatively impact shortnose sturgeon habitat.

INTEGRATION AND SYNTHESIS OF EFFECTS

Shortnose sturgeon are endangered throughout their entire range. This species exists as nineteen separate populations that show no evidence of interbreeding. The shortnose sturgeon residing in the Kennebec River form one of these nineteen populations.

NOAA Fisheries has estimated that the proposed action, issuing a new License Order for the Lockwood Project with the conditions recommended by FERC, will result in the injury of up to 2 shortnose sturgeon at the Project in any year due to stranding below the dam, however, injuries are expected to be minimal and no mortality is expected to occur. The license is expected to mitigate such effect by ensuring any shortnose sturgeon stranded in pools are returned safely downstream into the mainstem river. In addition, effects of the continued operation of the Lockwood Project on suitable shortnose sturgeon habitat, including spawning habitat, spawning activity, and general water quality are unlikely. Furthermore, the dam does not present a barrier to natural upstream migration since shortnose sturgeon would likely not move above Ticonic Falls even if the dam were removed. For these reasons, NOAA Fisheries believes that the issuance of a new License Order, as conditioned by FERC's recommendations, would not reduce the reproduction, numbers, and distribution of shortnose sturgeon in the Kennebec River.
It is not likely to reduce reproduction because it is not likely to affect spawning activity and/or suitable spawning habitat. It is not likely to reduce distribution because the existence of the dam does not impede shortnose sturgeon from accessing their full historic range in the Kennebec River (i.e., Ticonic Falls to the estuary). Given the effects of the dam, nor is it expected that the continued operation and maintenance of the dam would reduce the river by river distribution of shortnose sturgeon. While the existence and operation of the dam under the terms of the new license will continue to injure some shortnose sturgeon, these injuries are likely to be minor and no mortality is likely to occur. As such, it is not likely to reduce the numbers of shortnose sturgeon in the Kennebec River. The terms of the new License Order will also eliminate the potential for mortality during stranding events by requiring that the licensee follow the terms of the shortnose sturgeon handling plan. Because there is not likely to be any reduction in reproduction, numbers, and distribution of the Kennebec River shortnose sturgeon population, there is not likely to be any reduction in likelihood of survival and recovery in the wild of the Kennebec River population or the species as a whole.

CONCLUSION

After reviewing the current status of the Kennebec River population of shortnose sturgeon, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is NOAA Fisheries' biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the Kennebec River population of shortnose sturgeon or the species as a whole. No critical habitat has been designated for this species, therefore, none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. NOAA Fisheries interprets the term "harm" as an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding or sheltering (50 CFR §222.102). Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

Amount or Extent of Incidental Take

Incidental Take of Shortnose Sturgeon from stranding in pools below the Dam

The Lockwood Project has the potential to directly affect shortnose sturgeon by causing sturgeon to be stranded in pools during flashboard replacement or other project operations that create no-spill and no-leakage conditions in the bypassed reach. FERC and Merimil have indicated that this will only occur once or twice per year and that these conditions are not expected to last longer than 8 hours at a time. FERC is recommending that the License contain a provision ensuring that Merimil comply with a rescue and handling plan for shortnose sturgeon (see Appendix A). Based on the occurrence of one shortnose sturgeon stranding in the bypass reach in 2003, NOAA Fisheries anticipates that one shortnose sturgeon is likely to be stranded in these pools each time there are no-spill or no-leakage conditions in the bypassed reach during April through June when shortnose sturgeon are expected to be present at the Project. Incidental take from this source is not expected to exceed 2 fish per year (based on one fish per incident which FERC indicates may occur up to twice per year). While these fish may be injured, rapid rescue and the implementation of measures in the handling plan will ensure that only minor injuries occur and that no sturgeon are killed during stranding events.

NOAA Fisheries believes this level of incidental take is reasonable given the seasonal distribution and abundance of adult shortnose sturgeon in the immediate project area, the level of take historically in the action area, and the level of take of shortnose sturgeon at other hydroelectric facilities. In the accompanying biological opinion, NOAA Fisheries determined that this level of anticipated take is not likely to result in jeopardy to the species. NOAA Fisheries recognizes that this level of incidental take is based on several assumptions of the number of shortnose sturgeon likely to occur at the Lockwood Project each spring. As such, it may be necessary to modify this level of take as more information on the use of this area by shortnose sturgeon becomes available.

Reasonable and prudent measures

NOAA Fisheries believes the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of the Kennebec River population of shortnose sturgeon:

1. NOAA Fisheries must be contacted promptly before flashboard repair or replacement commences and again upon completion of these activities.
2. All interactions with shortnose sturgeon at the fish lift and/or in the event of a stranding must be reported to NOAA Fisheries.

Terms and conditions

In order to be exempt from prohibitions of section 9 of the ESA, FERC and the licensee must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements.

These terms and conditions are non-discretionary.

1. To implement RPM #1, the licensee must contact NOAA Fisheries (Julie Crocker: by email (julie.crocker@noaa.gov) or phone (978) 281- 9328 ext.6530) at least 24-hours before flashboard repair or replacement commences and within 24-hours of the completion of flashboard activity.

2. To implement RPM #2, the licensee must submit reports of all interactions with shortnose sturgeon by mail (to the attention of the Endangered Species Coordinator, NOAA Fisheries Protected Resources Division, One Blackburn Drive, Gloucester, MA 01930) and by fax (978-281-9394).

3. To implement RPM #2, by January 1 of each year, the licensee must discuss with NOAA Fisheries whether any updates to the handling plan are necessary. If required, all updates must be made by April 1 of each year.

4. To implement RPM #2, the licensee must contact NOAA Fisheries within 24 hours of any interactions with shortnose sturgeon, including non-lethal and lethal takes (Julie Crocker: by email (julie.crocker@noaa.gov) or phone (978) 281- 9328 ext.6530 or the Endangered Species Coordinator by phone (978)281-9208 or fax 978-281-9394)

5. To implement RPM #2, in the event of any lethal takes, any dead specimens or body parts should be photographed, measured, and preserved by the licensee (refrigerate or freeze) until they can be obtained by NOAA Fisheries for analysis.

6. To implement RPM #2, any injured shortnose sturgeon must be photographed and measured and the corresponding form must be completed and submitted to NOAA Fisheries within 24 hours Merimil and/or FPLE Maine personnel must be trained in shortnose sturgeon biology and should be able to recognize the severity of the shortnose sturgeon's injury. If the fish are badly injured, the species should be retained by the licensee, if possible, until obtained by a NOAA Fisheries recommended facility for potential rehabilitation.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, the level of incidental take is exceeded, reinitiation of consultation and review of the reasonable and prudent measures are required. FERC must immediately provide an explanation of the causes of the taking and review with NOAA Fisheries the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. NOAA Fisheries has determined that the issuance of a new license for the Lockwood Project is not likely to jeopardize the continued existence of endangered shortnose sturgeon. NOAA Fisheries recommends that FERC implement the following conservation recommendations.

(1) Population information on certain life stages is still sparse for this river system. FERC should support further studies to evaluate habitat and the use of the river, in general, by juveniles as well as use of the area upstream of the former Edwards Dam by all life stages.

(2) FERC should investigate the stranding of shortnose sturgeon in the pools below the Lockwood Dam, considering the flow rates and physical barriers that result in these strandings. FERC should also explore possible mitigation measures to alleviate these strandings. Physical and operational modifications should be considered to provide better natural access out of the pools.

(3) If any lethal take occurs, FERC and/or the Licensee should arrange for contaminant analysis of the specimen. If this recommendation is to be implemented, the fish should be frozen and NOAA Fisheries should be contacted immediately to provide instructions on shipping and preparation.

REINITIATION OF CONSULTATION

This concludes formal consultation on the actions outlined in the Environmental Assessment for the Lockwood Hydroelectric Project. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of taking specified in the Incidental Take Statement is exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in this biological opinion; or (4) a new species is listed or critical habitat designated that may be affected by the identified action. If the amount or extent of incidental take is exceeded, FERC must reinitiate consultation on the Lockwood Project immediately.

The conclusion of this biological opinion was based on the information available at the time of consultation. The conclusions of this consultation are based on correspondence from FERC indicating that the new License for the Lockwood Project will include all measures contemplated as the preferred alternative in the final EA issued in April 2004, including the recommendations by FERC and the requirements of the 1998 Kennebec Accord. Should the License that is ultimately issued by FERC differ from the preferred alternative considered in the EA, this would constitute a modification of the identified action that invalidates this BO and FERC would need to reinitiate consultation promptly.

Figure One
Map of Project Location

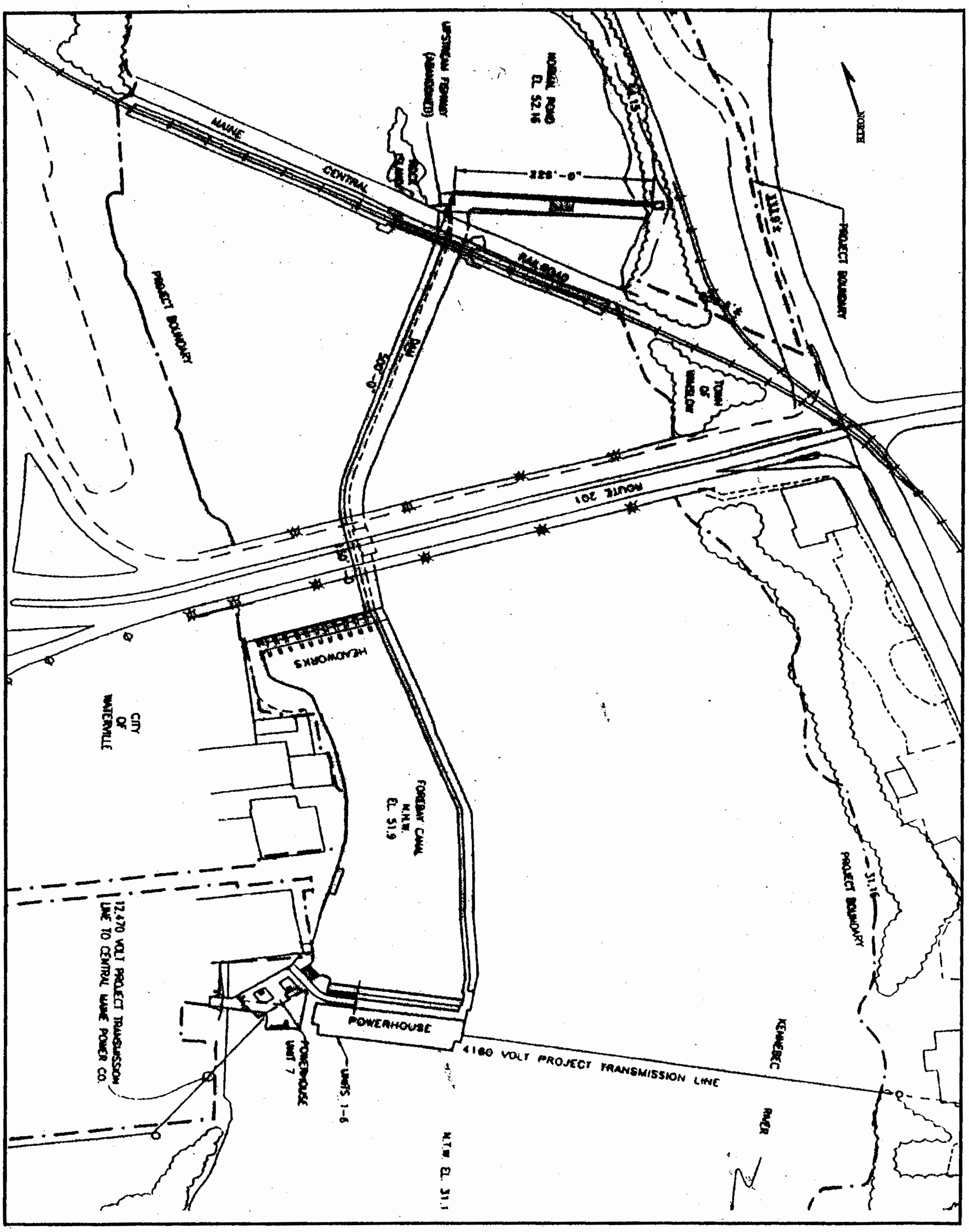
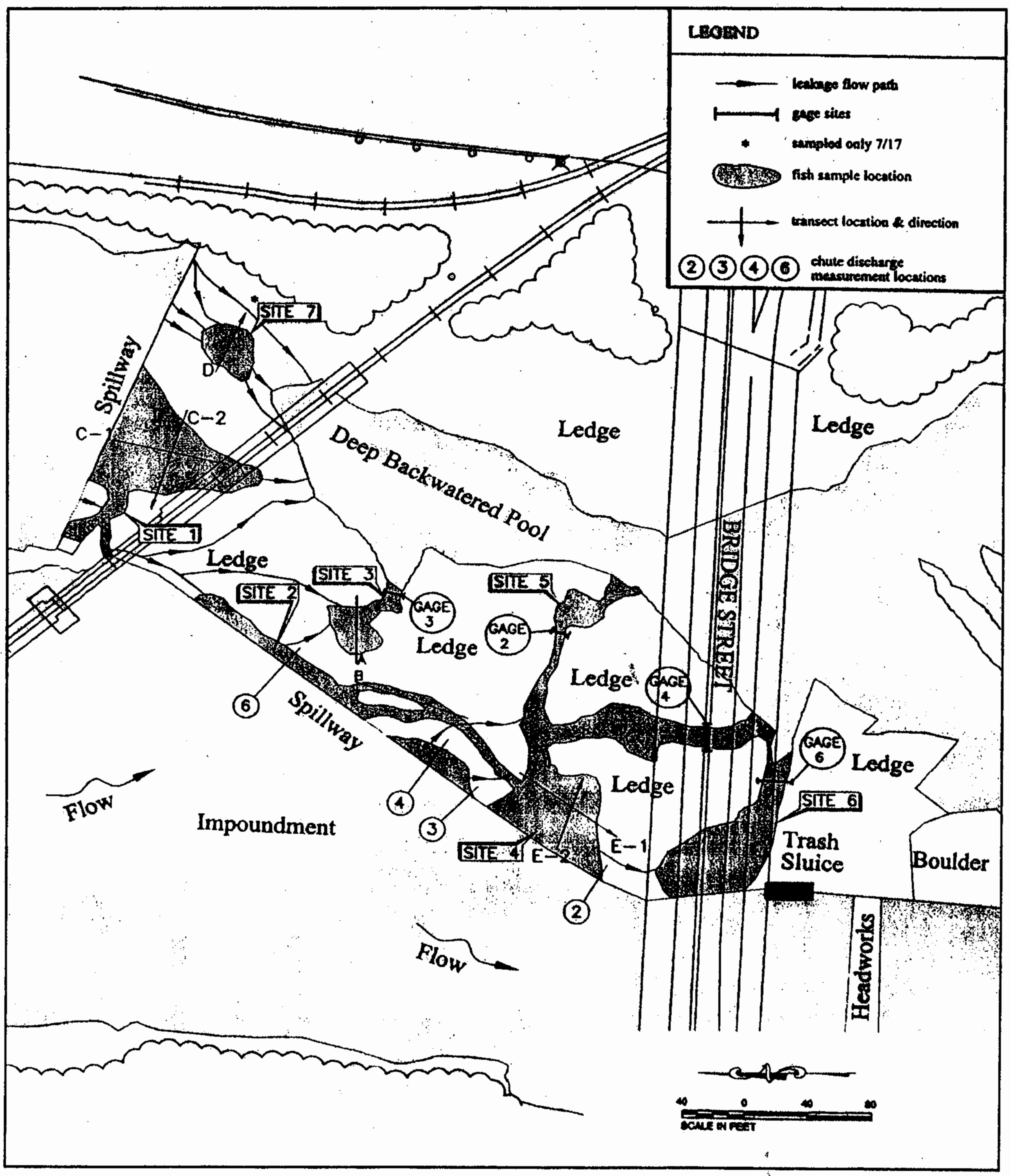


Figure Two
Habitat Map for the Lockwood Bypassed Reach



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APPENDIX A

Shortnose Sturgeon Handling Plan for Lockwood Project

This plan may be updated annually as appropriate

The Lockwood Project (Project) is a run-of-river facility located on the Kennebec River at river mile 63 in Waterville and Winslow, Maine. The Project is licensed by the Federal Energy Regulatory Commission to Merimil Limited Partnership. FPL Energy Maine Hydro LLC (FPLE Maine) is the general partner for Merimil Limited Partnership and is responsible for operating the Project.

This plan addresses how shortnose sturgeon found at the Lockwood Project dam will be handled and how this handling will be documented. Shortnose sturgeon may be encountered by personnel during fish lift operations, and in the event of stranding during flashboard replacement or other operations causing no-spill or no-leakage conditions. Procedures for handling fish and documenting these interactions are outlined below. All contact information and the appropriate reporting form follow these procedures.

<u>Shortnose Sturgeon Stranding</u>

The potential exists for shortnose sturgeon to be stranded in pools below the Dam whenever the flashboards are replaced or other operations cause no-spill or no-leakage conditions. If this situation occurs, these pools need to be checked as soon as possible for the presence of shortnose sturgeon and the following protocol shall be followed:

1. Designated FPLE Maine employees and fish lift operation staff must monitor the pools below the Dam for shortnose sturgeon presence while the flashboards are replaced.

2. The licensee shall follow the contact procedure outlined below to obtain a contact with the appropriate ESA permit/approval for handling shortnose sturgeon.

3. The licensee shall record the weight, length, and condition of each fish removed from the pool as well as river flow, bypass reach minimum flow, and water temperature. All relevant information must be recorded on the reporting sheet (*shortnose sturgeon REPORTING SHEET FOR THE LOCKWOOD PROJECT*, see attached).

4. If stranded but alive and uninjured, the shortnose sturgeon will be moved to the portion of the river below the Ticonic Falls that will provide egress out of the area.

5. If any injured shortnose sturgeon are found stranded in the pools below the dam, the licensee shall report immediately to NOAA Fisheries (see contact information below). Injured fish must be photographed and measured, if possible, and the reporting sheet must be submitted to NOAA Fisheries within 24 hours. If the fish is badly injured, the fish should be retained by the licensee, if possible, until obtained by a NOAA Fisheries recommended facility for potential rehabilitation.

6. The licensee shall report any dead fish immediately to NOAA Fisheries (see contact information below). Any dead specimens or body parts should be photographed, measured and preserved by the licensee until they can be obtained by NOAA Fisheries for analysis.

7. Contact Mike Hoover (FPLE Maine 207-623-8415 Kirk Toth (FPLE Maine 207-474-3921 x11); Bob Richter (FPLE Maine 207-795-1342 x243).

Contact information:

- If any shortnose sturgeon are detected – Mike Hoover (FPLE Maine 207-623-8415); Kirk Toth (FPLE Maine 207-474-3921 x11) Bob Richter (FPLE Maine 207-795-1342 x243).

- If unavailable, contact - Tom Squires (Maine Department of Marine Resources (207) 624-6348

- Within 24 hours of any stranding event, contact with an injured or dead shortnose sturgeon: contact NOAA Fisheries Northeast Regional Office –Julie Crocker (978-281-9328 x6530) or Pat Scida, (978-281-9208) and fax any reporting sheets to 978-281-9394. Messages should be left on voice mail or email (Julie.Crocker@noaa.gov) if unable to access by phone.

Reports at end of the year

- At the end of each year, copies of all reporting sheets will be sent to:

Endangered Species Coordinator
Protected Resource Division
NOAA Fisheries
One Blackburn Drive
Gloucester, MA 01930-2298

Bob Richter
FPL Energy Maine Hydro, LLC
150 Main Street
Lewiston, ME 04240

HORTNOSE STURGEON REPORTING SHEET FOR THE LOCKWOOD PROJECT

Date:____________________ Time:______________________________

Physical conditions
Is spill being released over the dam? YES NO
What is the approximate gauged river flow?________________________________ (Ex. 45,000 cfs)
What is the approximate gauged minimum flow in the bypass reach?__________________________
Water temperature (°C): ____________________________

Is project generating? YES NO

If yes, what units are currently being operating?

Location from where species was recovered : ____

Species information:
Total Length__________________ Fork length:__________________ Weight:______________
Condition of fish: ____

ᐟoes the sturgeon have visible injuries or abrasions: YES NO
If Yes, circle and code area of abrasions on sturgeon diagram on back side of sheet.

Comments/other: ____
____
____
____
____
____
____
____
____
____

Name of watch observer:____

Observer's Signature:____

Abrasion Codes

None

Light Whitening or smoothed scutes,
Early sign of skin abrasion.

Moderate Early sign of redness on skin, scutes or fins, Erosion of skin over bony structures,
Loss of skin pigment

Heavy Large portion of skin red, scutes excessively worn,
Damaged, or missing; patches of skin missing,
Boney structures exposed; flaccid musculature.